

WHAT IS CLAIMED IS:

1. A method for selectively forming photoresist patterns for making openings in a substrate, the method comprising:

depositing a layer of photoresist on the substrate having one or more types of photoresist dissolving agent generators;

exposing a first set of areas of the photoresist to a first light source through a first mask to activate a photoresist dissolving agent generator of a first type to release a first photoresist dissolving agent in the first set of areas; and

exposing a second set of areas of the photoresist to a second light source through a second mask to activate a photoresist dissolving agent generator of a second type to release a second photoresist dissolving agent in the second set of areas,

wherein the second set of areas is a sub set of the first set of areas such that the first and second photoresist dissolving agents in the second set of areas neutralize each other to protect the second set of areas from being used as the patterns for forming the openings.

2. The method of claim 1 wherein the photoresist dissolving agent generator of the first type is a photoacid generator and the first photoresist dissolving agent is a photoacid, and the photoresist dissolving agent generator of the second type is a photobase generator and the second photoresist dissolving agent is a photobase.

3. The method of claim 1 wherein the photoresist dissolving agent generator of the first type is a photobase generator and the first photoresist dissolving agent is

a photobase, and the photoresist dissolving agent generator of the second type is a photoacid generator and the second photoresist dissolving agent is a photoacid.

4. The method of claim 1 wherein the first and second light sources provide a light of the same wavelength.
5. The method of claim 1 wherein the first and second light sources provide lights of different wavelengths.
6. The method of claim 1 further comprising a bake process after the exposure to the second light source.
7. The method of claim 1 further comprising forming the openings in the substrate using the photoresist after the exposure to the second light source.
8. The method of claim 7 wherein the forming further includes:
 - developing and dissolving the photoresist in the first set of areas but not in the second set of areas;
 - removing the dissolved photoresist; and
 - forming the openings in the substrate underneath the removed photoresist.
9. A method for selectively forming photoresist patterns for making openings in a substrate, the method comprising:
 - depositing a layer of photoresist on the substrate having a first type of photoresist dissolving agent generator;

exposing a first set of areas of the photoresist to a first light source through a first mask to activate the first type of photoresist dissolving agent generator for releasing a first photoresist dissolving agent in the first set of areas;

coating a film containing a second type of photoresist dissolving agent generator;

exposing a second set of areas of the film to a second light source through a second mask to activate the second type of photoresist dissolving agent generator for releasing a second photoresist dissolving agent in the second set of areas,

wherein the second set of areas overlap one or more predetermined areas of the first set such that the second photoresist dissolving agent in the second set of areas neutralizes the first photoresist dissolving agent in the predetermined areas of the first set to protect the predetermined areas of the first set in the photoresist from being used as the patterns for forming the openings.

10. The method of claim 9 wherein the photoresist dissolving agent generator of the first type is a photoacid generator and the first photoresist dissolving agent is a photoacid, and the photoresist dissolving agent generator of the second type is a photobase generator and the second photoresist dissolving agent is a photobase.

11. The method of claim 9 wherein the photoresist dissolving agent generator of the first type is a photobase generator and the first photoresist dissolving agent is a photobase, and the photoresist dissolving agent generator of the second type is a photoacid generator and the second photoresist dissolving agent is a photoacid.

12. The method of claim 9 wherein the first and second light sources provide a light of the same wavelength.

13. The method of claim 9 wherein the first and second light sources provide lights of different wavelengths.

14. The method of claim 9 further comprising a bake process after the exposure to the second light source.

15. The method of claim 9 further comprising forming the openings in the substrate using the photoresist after the exposure to the second light source.

16. The method of claim 15 wherein the forming further includes:

developing and dissolving the photoresist in the first set of areas but not in the second set of areas;

removing the dissolved photoresist; and

forming the openings in the substrate underneath the removed photoresist.

17. A method for selectively forming photoresist patterns for making openings in a substrate using a packing-and-unpacking process, the method comprising:

depositing a layer of photoresist on the substrate having one or more types of photoresist dissolving agent generators;

using a packing mask for exposing a first set of areas of the photoresist to a first light source to activate a photoresist dissolving agent generator of a first type to release a first photoresist dissolving agent in the first set of areas; and

using an unpacking mask for activating a photoresist dissolving agent generator of a second type to release a second photoresist dissolving agent to neutralize the first photoresist dissolving agent in one or more predetermined areas

within the first set of the areas, thereby protecting the one or more predetermined areas from being used as the patterns for forming the openings.

18. The method of claim 17 wherein the photoresist dissolving agent generator of the second type is embedded in the photoresist.

19. The method of claim 18 wherein the using an unpacking mask further includes exposing the predetermined areas of the photoresist to a second light source.

20. The method of claim 17 wherein the photoresist dissolving agent generator of the second type is embedded in a coating film formed over the photoresist after using the packing mask.

21. The method of claim 20 wherein the using an unpacking mask further includes exposing a second set of areas of the coating film to a second light source, the second set of areas of the coating film being on top of the predetermined areas of the photoresist.

22. The method of claim 20 wherein the coating film is water soluble.

23. The method of claim 17 further comprising baking the photoresist to enhance the neutralization of the photoacid and photobase.